

CLAIMS

1. A control apparatus for an internal combustion engine which generates power by burning a mixture of fuel  
5 and air in a cylinder thereof, comprising:

in-cylinder pressure detecting means;

calculating means to calculate a combustion rate at  
predetermined timing based upon the in-cylinder pressure  
detected by the in-cylinder pressure detecting means and  
10 an in-cylinder volume at timing of detecting the  
in-cylinder pressure; and

correction means to correct timing of combustion  
starting in the cylinder so that the combustion rate  
calculated by the calculating means is equal to a target  
15 value.

2. The control apparatus for the internal combustion engine according to claim 1, wherein:

the calculating means calculates the combustion rate  
20 at the predetermined timing based upon a control parameter  
including a product of the in-cylinder pressure detected  
by the in-cylinder pressure detecting means and a value  
obtained by exponentiating the in-cylinder volume at the  
timing of detecting the in-cylinder pressure with a  
25 predetermined index.

3. The control apparatus for the internal combustion

engine according to claim 2, wherein:

the predetermined timing is set between first timing set after the opening of an intake valve and before the combustion starting and second timing set after the combustion starting and before the opening of an exhaust valve; and

the calculating means calculates the combustion rate based upon a difference in the control parameter between the first and the second timing and a difference in the control parameter between the first timing and the predetermined timing.

4. A control apparatus for an internal combustion engine which generates power by burning a mixture of fuel and air in a cylinder thereof, comprising:

in-cylinder pressure detecting means;

calculating means to calculate a heat generation rate at predetermined timing based upon the in-cylinder pressure detected by the in-cylinder pressure detecting means and an in-cylinder volume at timing of detecting the in-cylinder pressure; and

correction means to correct timing of combustion starting in the cylinder based upon the heat generation rate calculated by the calculating means.

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5. The control apparatus for the internal combustion engine according to claim 4, wherein:

the calculating means calculates the heat generation rate at the predetermined timing based upon a control parameter including a product of the in-cylinder pressure detected by the in-cylinder pressure detecting means and a value obtained by exponentiating the in-cylinder volume at the timing of detecting the in-cylinder pressure with a predetermined index.

6. The control apparatus for the internal combustion engine according to claim 5, wherein:

the calculating means calculates the heat generation rate based upon a difference in the control parameter between two predetermined points.

7. A control method for an internal combustion engine which generates power by burning a mixture of fuel and air comprising the steps of:

(a) detecting an in-cylinder pressure;

(b) calculating a combustion rate at predetermined timing based upon the in-cylinder pressure detected in the step (a) and an in-cylinder volume at timing of detecting the in-cylinder pressure; and

(c) correcting timing of combustion starting in the cylinder so that the combustion rate calculated in the step

(b) is equal to a target value.

8. The control method for the internal combustion

engine according to claim 7, wherein:

the step (b) includes calculating the combustion rate at the predetermined timing based upon a control parameter including a product of the in-cylinder pressure detected  
5 in the step (a) and a value obtained by exponentiating the in-cylinder volume at the timing of detecting the in-cylinder pressure with a predetermined index.

9. The control method for the internal combustion  
10 engine according to claim 8, wherein:

the predetermined timing is set between first timing set after the opening of an intake valve and before the combustion starting and second timing set after the combustion starting and before the opening of an exhaust  
15 valve; and

in the step (b), the combustion rate is calculated based upon a difference in the control parameter between the first and the second timing and a difference in the control parameter between the first timing and the  
20 predetermined timing.

10. A control method for an internal combustion engine which generates power by burning a mixture of fuel and air  
25 comprising the steps of:

(a) detecting an in-cylinder pressure;

(b) calculating a heat generation rate at

predetermined timing based upon the in-cylinder pressure detected in the step (a) and an in-cylinder volume at timing of detecting the in-cylinder pressure; and

(c) correcting timing of combustion starting in the  
5 cylinder based upon the heat generation rate calculated in the step (b).

11. The control method for the internal combustion engine according to claim 10, wherein:

10 the step (b) includes calculating the heat generation rate at the predetermined timing based upon a control parameter including a product of the in-cylinder pressure detected in the step (a) and a value obtained by exponentiating the in-cylinder volume at the timing of  
15 detecting the in-cylinder pressure with a predetermined index.

12. The control method for the internal combustion engine according to claim 11, wherein:

20 the step (b) includes calculating the heat generation rate based upon a difference in the control parameter between two predetermined points.